# Microstructure and inertial characteristics of a magnetite ferrofluid over a stretching/shrinking sheet using effective thermal conductivity model

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**ABSTRACT**

Nanofluid is the most promising gift of modern science to improve the heat transfer capabilities of conventional heat transfer fluids. However, one of the most crucial drawbacks for classical nanofluid models is that they cannot describe a class of fluids that have certain microscopic characters arising from the micro-rotation and local struc-ture of the fluid elements. In this work, the innovative micropolar nanofluid model is introduced to study the mi-crostructure and inertial characteristics of the substructure particles. More exactly, the flow and heat transport of micropolar ferrofluid over a stretching/shrinking sheet subjected to suction and injection is studied. Magnetite-Fe3O4 (iron oxide) nanoparticles are considered in water taken as conventional base fluid. The mathematical model has been formulated based on Tiwari-Das nanofluid model. Explicit exact solutions of non-linear coupled momentum equations are obtained. The solution of energy equation is obtained in terms of Whittaker function with the help of Maple. The impacts of pertinent parameters on velocity, micro-rotation velocity and temperature are shown graphically for positive and negative mass transfer flow and analyzed in detail. The results show that micro-rotation velocity increases first and then decreases. There is a remarkable change occurs to micro-rotation velocity for positive and negative values of mass transfer parameter. Presence of mass transfer parameter accel-erate the profiles near the flow domain and then decelerates it. Further, micropolar ferrofluid have higher veloc-ity than the classical nanofluid. Comparison have been made with published data under special cases and obtained in close agreement.

***Keywords:*** Micropolar fluid; Magnetite Fe3O4 nanoparticles Stretching/shrinking sheet Whittaker function